27th.—Escanaba, Michigan: an auroral display was visible from 9.20 to 11.47 p. m.; numerous beams covered the northern sky, and appeared and disappeared in quick succession.

27th.—Alpena, Michigan: an aurora appeared at 9.40 p. m., consisting of a faint arch, extending to an altitude of 40°; at 10 p. m. numerous slender beams shot upward, rising and falling in quick succession with an apparent motion from east to west; the display ended at 11.30 p. m.

27th.—Portland, Maine: an aurora was observed from 10.25 to 11.50 p. m.; owing to the bright moonlight the display was scarcely perceptible.

27th.—Eastport, Maine: an aurora was visible from 10.20 p. m. until the early a. m. of the 28th. A bank of haze extended along the horizon from east to west and from it streamers shot upward to beyond the zenith, assuming the form of "merry dancers." The light from the full moon diminished the brilliancy of the display.

The display of the 27th was also observed at Montreal, Quebec, and Halifax, Nova Scotia.

31st.—Madison, Wisconsin: auroral streamers were observed during the evening.

THUNDER-STORMS.

Thunder-storms occurred in the various districts during the month as follows:

New England.—3d, 4th, 9th, 10th, 12th, 19th, 27th, 31st.

Middle Atlantic states.—1st, 2d, 4th, 5th, 6th, 9th, 16th, 21st to 27th, 29th, 30th, 31st.

South Atlantic states.—1st, 2d, 5th, 6th, 7th, 9th, 12th to 17th, 20th to 31st.

Florida peninsula.—4th to 7th, 9th, 11th to 31st.

Eastern Gulf states.—6th, 14th, 15th, 20th to 30th.

Western Gulf states.—1st to 8th, 13th to 21st, 24th to 29th.

Rio Grande valley.—1st, 2d, 4th, 5th, 7th, 8th, 11th, 14th to 17th, 20th, 25th, 29th, 30th.

Tennessee.—1st, 6th, 19th, 21st to 30th.

Ohio valley.—1st, 5th to 11th, 13th, 17th to 27th, 28th to 31st.

Lower lake region.—4th to 7th, 13th, 18th, 19th, 21st to 25th, 29th, 30th, 31st.

Upper lake region.—3d to 6th, 12th, 17th, 18th, 21st, 22d, 24th, 25th, 26th, 29th, 30th, 31st.

Extreme northwest.—4th, 6th, 7th, 13th, 14th, 15th, 18th, 20th to 23d, 26th, 27th.

Upper Mississippi valley.—1st to 6th, 12th, 16th to 19th, 21st, 23d, 24th, 26th to 31st.

Missouri valley.—2d to 7th, 14th to 31st.

Northern slope.—1st to 5th, 13th to 21st, 23d, 25th, 26th, 27th, 30th, 31st.

Middle slope.—2d, 3d, 5th, 6th, 7th, 10th, 14th to 30th.

Southern slope.—1st, 3d, 4th, 7th, 8th, 11th, 12th, 13th, 16th to 20th, 22d to 27th, 29th.

Southern plateau.—2d, 3d, 4th, 7th to 12th, 18th, 23d, 25th, 30th.

Middle plateau.—4th, 7th to 12th, 18th, 26th, 27th.

Northern plateau.—2d, 3d, 4th, 6th, 7th, 8th, 11th, 12th, 19th, 20th, 21st, 25th, 28th to 31st.

Middle Pacific coast region.—1st, 2d, 6th, 12th, 15th.

South Pacific coast region.—Yuma, Arizona, 3d.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories as follows:

Arkansas.—6th, 10th, 13th, 15th, 16th, 18th, 20th, 25th, 27th.

California.—2d, 4th, 10th, 11th, 13th, 14th, 17th, 18th, 19th, 21st, 24th, 25th, 27th.

Colorado.—13th.

Connecticut.—12th, 13th, 21st, 26th to 29th.

Dakota.—5th, 10th, 11th, 15th, 16th, 19th, 24th, 28th.

Delaware.—18th.

District of Columbia.—7th, 12th, 25th.

Florida.—3d, 4th, 8th, 9th, 16th, 18th, 19th, 20th, 22d, 23d, 27th, 31st.

Georgia.—5th, 9th, 14th, 15th, 18th.

Idaho.—24th, 25th.

Illinois.—2d, 7th, 11th, 16th, 19th, 26th, 27th, 28th.

Indiana.—19th, 20th, 26th.

Iowa.—2d, 3d, 7th, 8th, 10th, 11th, 16th, 20th, 21st, 25th, 26th, 31st.

Kansas.—6th, 10th, 19th, 23d, 25th, 28th.

Louisiana.—4th.

Maine.—1st, 22d.

Massachusetts.—12th, 27th, 29th.

Michigan.—2d, 3d, 6th, 12th, 21st, 22d, 27th, 28th.

Minnesota.—14th, 18th, 21st, 24th, 27th, 31st.

Missouri.—10th.

Nebraska.—1st to 4th, 6th to 10th, 12th, 13th, 14th, 17th, 18th, 22d, 26th, 29th.

Nevada.—5th, 20th, 26th, 29th.

New Hampshire.—20th, 22d, 26th, 29th.

New Jersey.—12th, 16th, 18th.

New Mexico.—18th.

New York.—1st, 3d, 6th, 12th, 13th, 14th, 19th, 24th, 26th to 29th.

North Carolina.—2d, 5th, 7th, 10th, 16th, 21st, 25th, 28th.

Ohio.—5th, 7th, 11th, 12th, 15th, 17th, 18th, 19th, 21st, 23d, 25th, 27th, 28th, 30th, 31st.

Oregon.—10th, 18th, 23d, 24th, 27th, 28th.

Pennsylvania.—19th, 28th, 29th, 30th.

Rhode Island.—22d.

South Carolina.—1st, 5th, 9th, 11th, 19th, 21st.

Tennessee.—5th, 11th, 14th, 19th.

Utah.—25th.

Virginia.—6th, 7th, 17th, 19th, 23d, 25th, 26th.

Washington Territory.—4th, 11th, 29th.

Wisconsin.—11th, 20th, 21st, 27th.

Wyoming.—11th, 23d.

LUNAR HALOS.

Lunar halos were observed in the various states and territories as follows:

Arizona.—2d, 3d, 18th, 21st, 25th.

Arkansas.—24th, 27th.

California.—18th.

Connecticut.—24th, 27th.

Dakota.—17th, 18th, 21st to 24th, 26th, 29th.

Florida.—22d, 23d, 24th;

Georgia.—5th, 22d, 24th.

Idaho.—24th.

Illinois.—20th, 24th to 27th.

Indiana.—17th, 18th, 20th, 23d, 25th, 26th, 27th.

Iowa.—19th, 24th to 27th.

Kansas.—6th, 9th, 17th, 19th, 22d, 24th, 25th, 27th.

Kentucky.—23d.

Louisiana.—19th, 20th, 21st, 28th.

Maine.—26th.

Maryland.—20th, 23d, 25th.

Massachusetts.—21st, 22d, 26th, 27th.

Michigan.—20th, 21st, 23d, 27th, 28th.

Minnesota.—19th, 26th, 27th, 28th.

Missouri.—5th, 18th, 25th.

Nebraska.—14th, 20th, 22d to 25th, 30th.

Nevada.—22d, 27th.

New Hampshire.—21st, 22d.

New Jersey.—19th, 20th, 23d, 26th.

New York.—4th, 21st, 24th, 27th.

North Carolina.—13th, 18th, 23d, 25th, 26th.

Ohio.—20th, 21st, 23d, 25th, 28th.

Oregon.—21st, 22d, 24th.

Pennsylvania.—20th, 24th, 27th, 28th.

Rhode Island.—27th.

Tennessee.—20th, 23d, 25th, 27th, 28th.

Texas.—18th, 20th to 25th, 27th.

Vermont.—22d.
Virginia.—6th, 19th, 20th, 21st, 23d to 26th.
Washington Territory.—23d.
West Virginia.—21st.
Wisconsin.—20th, 21st, 26th, 27th, 28th.
Wyoming.—19th.

The phases of the moon during May, 1885, were: last quarter, 7th, 3.37 a. m.; new moon, 14th, 10.11 a. m.; first quarter, 21st, 12.39 a. m.; full moon, 28th, 3.25 p. m.; apogee, 4th, 5.18 a. m., and 31st, 6.54 p. m.; perigee, 16th, 4.54 a. m.

MIRAGE.

Mirage was observed at the following stations during the month:

Webster, Dakota, from 2d to 5th, 9th to 14th, 17th to 21st, 25th, 27th, and 30th.
Tucson, Arizona, 8th.
Harvard, Nebraska, 18th.
Manistique, Michigan, 19th, 25th.
Grand Haven, Michigan, 27th.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty stations show 5,046 observations to have been made, of which thirteen were reported doubtful; of the remainder, 5,033, there were 4,284, or 85.1 per cent., followed by the expected weather.

SUN SPOTS.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for May, 1885:

Date—May, 1885.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
2, 5 p. m...	0	20‡	.....	.....	.....	.....	7	70‡	Broad areas of faculæ.
3, 5 p. m..	1	20‡	2	5	1	3	6	85‡	Do.
9, 11 a. m...	.....	.....	.....	.....	.....	.....	9	90‡	
10, 11 a. m...	0	0	4	10‡	0	0	6	65‡	
11, 6 p. m...	1	5	0	10‡	0	0	7	60‡	Broad areas of faculæ.
12, 12 m	0	0	3	10‡	0	0	4	50‡	
15, 12 m	1	3	.....	.....	1	3	3	10	
16, 11 a. m...	1	15‡	0	3	.....	.....	4	25‡	
19, 10 a. m...	.....	.....	.....	.....	.....	.....	5	65‡	Two of the spots very large—one with bright nucleus in umbra.
5 p. m...	1	10‡	0	0	1	2	6	75‡	
21, 9 a. m...	1	2	0	0	0	0	7	75‡	
12 m	0	0	0	0	0	0	7	75‡	
4 p. m	0	10‡	0	0	0	0	7	85‡	
22, 4 p. m...	0	30‡	0	0	0	0	7	115‡	
24, 11 a. m...	1	2	0	0	1	2	8	100‡	
25, 4 p. m....	0	50‡	0	0	0	0	8	160‡	Three spots quite large.
26, 6 p. m...	1	5	1	5	0	0	8	150‡	Do.
28, 10 a. m...	2	5‡	.....	.....	2	5‡	8	85‡	Do.
29, 4 p. m...	1	5‡	0	15‡	0	0	9	50‡	Broad areas of faculæ.

Faculæ were seen at the time of every observation. ‡Approximated.

Prof. L. G. Carpenter, of the Michigan State Agricultural College, Lansing, reports sun spots during May, as follows:

1st, 7 p. m., seven groups, thirty-eight spots; 2d, 11 a. m., six groups, forty-five spots; 4th, 3.20 p. m., five groups, thirty spots; 11th, 3.45 p. m., six groups, twenty-five spots; 12th, —— p. m., five groups, thirty-three spots; 16th, 3.30 p. m., three groups, twenty-seven spots; 18th, 3.45 p. m., four groups, twenty-three spots; 28th, —— p. m., seven groups, thirty-nine spots.

The Chief Signal Officer has received from Mr. Frank Rede Fowke, Secretary to the Solar Physics Committee, Science and Art Department, London, S. W., a tabulated statement of the "dates of coincidence of the assumed prime meridian of the sun with the central meridan of the visible hemisphere," covering the period from 1873 to 1885, both inclusive. The following relating to the year 1885, is from the table above referred to:

Month.	Date.	Greenwich mean solar time.	Day of year and decimal of day.	Month.	Date.	Greenwich mean solar time.	Day of year and decimal of dry.
		h. m.				h. m.	
January	26	14 38	25.61	July	9	4 5	189.17
February	22	22 48	52.95	August	5	9 22	216.39
March	22	6 14	80.26	September	1	15 7	243.63
April	18	12 58	107.54	September	28	21 36	270.90
May	15	18 29	134.77	October	26	4 48	298.20
June	11	23 17	161.97	November	22	12 14	325.51
				December	19	19 55	352.83

The day of the year and the decimals of a day are reckoned from Greenwich mean noon of January 1st.

The assumed prime meridian is that which coincided with the ascending node of the sun's equator at the epoch 1854.0.

The assumed period of rotation is 25.38 mean solar days.

DROUGHT.

Bangor, Maine: on the 31st there was a heavy rainfall; previous to that date the crops were in need of rain.

Sanford, Florida: the rains on the 19th ended a drought which had prevailed in this vicinity for six weeks.

Cedar Keys, Florida: drought prevailed in this region during the month until the 21st, when 1.05 inches of rain fell. The drought had prevailed for two months and as a result, the water supply was very limited and crops suffered seriously.

Milwaukee, Wisconsin: up to the 29th, barley, oats and wheat were suffering in consequence of drought. The monthly rainfall was the least that has fallen in May during the last fourteen years.

Spokane Falls, Washington Territory: the rain on the 13th was of great benefit to the crops, which were suffering from drought.

Red Bluff, California, 31st: stockmen report that in the mountain regions the present season has been the driest known for many years, and that stock has suffered in consequence of poor pasturage and scarcity of water.

Beloit, Rock county, Wisconsin: the month of May was unusually dry in this region.

Sussex, Waukesha county, Wisconsin, 31st: the grain and grass crops suffered seriously from drought during the month, which was the driest known for ten years.

EARTHQUAKES.

Winnemucca, Nevada, 1st: a slight shock of earthquake occurred at 9.30 p. m., local time (12.21 a. m., 75th meridian). It was noticed by many persons in the central and lower portions of the town, while it was not perceptible east of the railroad. It is reported to have caused swinging lamps to vibrate, crockery and windows to rattle, etc. Persons out of doors did not feel the shock, but some report having heard a rumbling noise, which was supposed to have been due to the earthquake.

The following is taken from "Nature," of May 7, 1885:

At half-past 1 o'clock, on the morning of the 1st instant, two or three rather violent shocks of earthquake were felt at Vienna, Austria, accompanied by a rolling noise, and causing a great clattering of furniture.

Shocks of far greater violence were experienced in Styria, where many houses were damaged and some persons killed. In the western districts the shocks were of a light character. The phenomenon appears to have extended southward as far as Grätz and westward to Bavaria. A shock was also felt at Monte Carlo, at ten minutes to 3, on the morning of the 2d instant. The shock was strongest in the districts of Condamone and the Cap d'Aile.

Olympia, Washington Territory, 3d: a light earthquake shock occurred at 11.30 p. m. (local time). Light shocks continued until 1.30 a. m., of the 4th.

The following is taken from "Nature" of May 28, 1885:

Shocks of earthquake were felt at Wartberg and Kindberg, Austria, on May 20, toward 1.30 a. m.

A sharp shock was felt at Smyrna, Turkey, at 7.15 p. m., on May 26.